Letter to the Editor

Comment on "Two-stage batch sorber design using second-order kinetic model for the sorption of metal complex dyes onto pine sawdust" by Özacar, M. and Şengýl, İ.A.

Recently, Özacar and Şengýl published the paper "Two-stage batch sorber design using second-order kinetic model for the sorption of metal complex dyes onto pine sawdust" [1]. In Section 3.3.1 'pseudo first- and second-order equations' the authors used Eqs. (1)–(5) in the paper and cited 4 papers and 2 papers as secondary references for pseudo first- and second-order equations, respectively. Authors cited their two previous publications [2,3] and others [4,5] for pseudo first-order equation. In fact, a citation review of the Lagergren's first-order rate equation for adsorption reactions has been presented [6]. The correct reference citing the original Lagergren paper was first presented by Ho and McKay in 1998 [7–10]; "Lagergren, S., Zur theorie der sogenannten adsorption gelöster stoffe, *Kungliga Svenska Vetenskapsakademiens. Handlingar*, Band 24, No. 4, 1898, pp. 1–39. [11]". Its English translated is "Lagergren, S., About the theory of so-called adsorption of soluble substances, *Kungliga Svenska Vetenskapsakademiens. Handlingar*, Band 24, No. 4, 1898, pp. 1–39." and the abbreviation style is "Lagergren, S., Zur theorie der sogenannten adsorption gelöster stoffe. *K. Sven. Vetenskapsakad. Handl.*, Band 24, No. 4, 1898, pp. 1–39." In order to distinguish a kinetics equation based on the adsorption capacity of a solid from one based on the concentration of a solution, Lagergren's first-order rate equation has been called pseudo-first order [7–10]. Ho pointed that the Lagergren's equation has been widely cited, there are far more mistakes made in the reference section of a paper than anywhere else, such as author, journal title, year, volume and page number [6]. It is clear that most of the papers citing the Lagergren's original paper published before 1998 are incorrect. However, numerous researchers used the secondary reference without knowing the mistakes have already been made in their source of references, such as taking references straight from secondary references. It has been suggested that an accurate citation allow the reader to retrieve the cited reference readily [12].

For second-order equation, authors cited their two previous publications as secondary references. In fact, the second-order kinetic expression for the adsorption systems of divalent metal ions using sphagnum moss peat has been reported by Ho [13]. In order to distinguish kinetics equation based on adsorption capacity of solid from one based on the concentration of solution. Ho's second-order rate experession has been called pseudo-second order [7–11,13–15]. The earlier application of the pseudo-second-order equation to the kinetic studies of competitive heavy metal adsorption by sphagnum moss peat was undertaken by Ho et al. [14]. The modified model was also reported in subsequent years [7–11,13–27]. In addition, Azizian has presented a theoretical analysis for pseudo-second order equation [29]. The most frequently cited papers were published in *Environmental Technology* [14], *Process Safety and Environmental Protection* [7,8], *Journal of Environmental Science and Health Part A-Toxic/Hazardous Substances & Environmental Engineering* [15], *Chemical Engineering Journal* [9], *Resources, Conservation and Recycling* [16], *Process Biochemistry* [17], and *Water Research* [18]. In addition, similar comments have also been published in *Adsorption Science & Technology* [19], *Journal of Colloid and Interface Science* [20–22], *Journal of Chemical Technology and Biotechnology* [23], *Biochemical Engineering Journal* [24], *Bioresource Technolog* [25], *Environmental Science & Technology* [26], *Water Research* [27], and *Fresenius Environmental Bulletin* [28].

The pseudo-second order rate expression of Ho has been widely applied to the sorption of metal ions, dyes, herbicides, oil and organic substances from aqueous solutions [19–28]. Moreover, discussion of the reaction order has been reported such as the comparison of chemisorption kinetic models [7] and pseudo-second order model [17]. Furthermore, Ho's kinetic expression has also been applied to a multi-stage batch adsorption design [30,31], and pseudo-isotherm studies [32,33]. It is clear that authors used the idea from Ho and McKay references [7–9,14–18] for two-stage batch sorber design [30,31]. However, the pseudo-second order kinetic model applied in this paper without citing Ho's relevant works [7–9,14–18].

A paper contributes not only by its originality and creativity, but also by its continuity and development toward subsequent research. Readers of published scientific articles may wish to retrieve cited references to further their follow up researches and knowledge or to confirm claims made by the researchers [34]. The reference section can play a key role to researchers who were interested in the paper's statement

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and would like to follow the study or find useful information from the paper [6]. I suggest that Özacar and Şengýl cite Lagergren's pseudo-first order kinetic model paper and Ho's original pseudo-second order kinetic expression paper, or their relevant work.

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